

Week 4

```
File1 = open("resources/data/Example2.txt","w")
```

Open function

File Object

File object

A large blue rounded rectangle containing the text ".read()", representing a file object.

. read()

This is line 1

```
File1 = open("resources/data/Example2.txt","w")
```

Open function

```
File1 = open("/resources/data/Example2.txt","w")
```

File Path

File name

```
File1 = open("/resources/data/Example2.txt","w")
```

Directory

```
File1 = open("/resources/data/Example2.txt","w")
```

```
File1 = open("/resources/data/Example2.txt","w")
```



The diagram consists of a black bracket with two vertical lines extending downwards from its top horizontal bar, enclosing the character 'w' which is part of the string argument in the code.

Mode

File object

```
File1 = open("/resources/data/Example2.txt","w")
```

File1



File1.name

Based on the tutorial : Python
Tutorial: File Objects - Reading and
Writing to Files by Corey Schafer

Question

What does the attribute **name** of the file object display ?

- The name of the file
- The mode of the file

✓ **Correct**

correct

Fi

Skip

Continue

File1



'/resources/data/Example1.txt'

'r'

File1.name

'/resources/data/Example1.txt'

File1.mode

'r'

File1.close()



with open("Example1.txt","r") as File1:
 file_stuff=File1.read()
 print(file_stuff)
 print(File1.closed)
 print(file_stuff)

Indented Block

```
with open("Example1.txt","r") as File1:  
    file_stuff=File1.read()  
    print(file_stuff)
```

End of
block, close
file object



```
print(File1.closed)  
print(file_stuff)
```

Question

What is the advantage of using the **with** statement to open a file

- it automatically closes the file object
- it saves a backup



correct

Skip

Continue

```
with open("Example1.txt","r") as File1:
```

```
    file_stuff=File1.readlines()  
    print(file_stuff)
```

file_stuff[0]

This is line 1

file_stuff[1]

This is line 2

file_stuff[2]

This is line 3

```
file_stuff: ['This is line 1 \n', 'This is line 2 \n', 'This is line 3']
```

```
with open("Example1.txt","r") as File1:
```

```
    file_stuff=File1.readline()
```

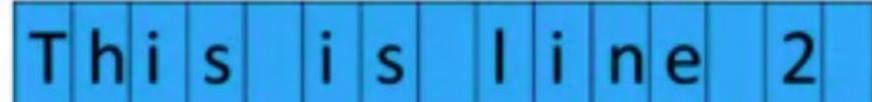
```
    print(file_stuff)
```

```
    file_stuff=File1.readline()
```

```
    print(file_stuff)
```



This is line 1

A yellow rectangular grid divided into 12 equal-sized squares. The text "This is line 1" is written across the top 11 squares, with the 12th square being empty.

This is line 2

A blue rectangular grid divided into 12 equal-sized squares. The text "This is line 2" is written across the top 11 squares, with the 12th square being empty.

This is line 1

This is line 2

```
with open("Example1.txt","r") as File1:
```

```
    for line in File1:  
        print(line)
```

This is line 1
This is line 2
This is line 3

This is line 1

This is line 2

This is line 3

```
with open("Example1.txt","r") as File1:  
  
    file_stuff=File1.readlines(16)  
    print(file_stuff)  
    file_stuff=File1.readlines(5)  
    print(file_stuff)  
    file_stuff=File1.readlines(9)  
    print(file_stuff)
```

This is line 1

This

is line 2

This is line 1

This is line 2

This is line 3

File Object

File object

This is line 1

```
. write("This is line 1")
```



File Object

File object

```
. write("This is line 1")
```

This is line 1

```
with open("/resources/data/Example2.txt", "w") as File1:
```

```
    File1.write ("This is line A\n" )  
    File1.write ("This is line B\n")
```

This is line A
This is line B

Example2.txt

Question

Consider the file object **File1** in write mode, what would the following line of code write to the file:

```
1 File1.write("Hello\n world")
```

- Hello\n world
- Hello
world
- Hello world



Correct

correct the \n represents a new line

Skip

Continue

```
Lines=["This is line A\n","This is line B\n","This is line C\n"]
```

```
with open("/resources/data/Example2.txt", "w") as File1:
```

```
    for line in Lines:
```



```
        3    File1.write(line)
```

```
This is line A  
This is line B  
This is line C
```

Example2.txt

```
with open("/resources/data/Example2.txt", "a") as File1:
```

```
    File1.write ("This is line C" )
```

This is line A
This is line B
This is line C

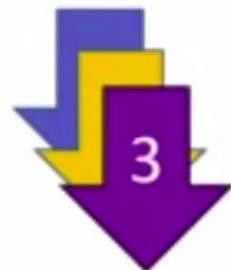
Example2.txt

```
with open("Example1.txt", "r") as readfile:
```

```
    with open("Example3.txt", "w") as writefile:
```

```
        for line in readfile:
```

```
            writefile.write(line)
```



This is line A
This is line B
This is line C

Example1.txt

This is line A
This is line B
This is line C

Example3.txt

 Back

Practice Quiz

Practice Quiz • 12 min • 4 total points

1. What are the most common modes used when opening a file?

1 / 1 point

- (a)ppend, (c)lose, (w)rite
- (a)ppend, (r)edline, (w)rite
- (a)ppend, (r)ead, (w)rite
- (s)ave, (r)ead, (w)rite

 Correct

2. What is the data attribute that will return the title of the file?

1 / 1 point

- File1.open()
- File1.name
- File1.mode
- File1.close()

 Correct

 Back

Practice Quiz

Practice Quiz • 12 min • 4 total points

3. What is the command that tells Python to begin a new line?

1 / 1 point

- \e
- \q
- \n
- \b

 Correct

4. What attribute is used to input data into a file?

1 / 1 point

- File1.close()
- File1.write()
- File1.read()
- File1.open()

 Correct

Importing Pandas

```
import pandas  
csv_path='file1.csv'  
df=pandas.read_csv(csv_path)
```

pandas

read_csv()
Series()
DataFrame
values
:
:
:

Importing

```
import pandas as pd  
csv_path='file1.csv'  
df= pd.read_csv(csv_path)
```

Importing

```
import pandas as banana  
csv_path='file1.csv'  
df=banana.read_csv(csv_path)
```

Dataframes

```
csv_path='file1.csv'
```

```
df= pd.read_csv(csv_path)
```

```
df.head()
```

	Artist	Album	Released	Length	Genre	Music Recording Sales (millions)	Claimed Sales (millions)	Released.1	Soundtrack	Rating
0	Michael Jackson	Thriller	1982	0:42:19	pop, rock, R&B	46.0	65	30-Nov-82	NaN	10.0
1	AC/DC	Back in Black	1980	0:42:11	hard rock	26.1	50	25-Jul-80	NaN	9.5
2	Pink Floyd	The Dark Side of the Moon	1973	0:42:49	progressive rock	24.2	45	01-Mar-73	NaN	9.0
3	Whitney Houston	The Bodyguard	1992	0:57:44	R&B, soul, pop	27.4	44	17-Nov-92	Y	8.5
4	Meat Loaf	Bat Out of Hell	1977	0:46:33	hard rock, progressive rock	20.6	43	21-Oct-77	NaN	8.0

Dataframes

```
xlsx_path='file1.xlsx'
```

```
df= pd.read_excel(xlsx_path)
```

```
df.head()
```

	Artist	Album	Released	Length	Genre	Music Recording Sales (millions)	Claimed Sales (millions)	Released.1	Soundtrack	Rating
0	Michael Jackson	Thriller	1982	0:42:19	pop, rock, R&B	46.0	65	30-Nov-82	NaN	10.0
1	AC/DC	Back in Black	1980	0:42:11	hard rock	26.1	50	25-Jul-80	NaN	9.5
2	Pink Floyd	The Dark Side of the Moon	1973	0:42:49	progressive rock	24.2	45	01-Mar-73	NaN	9.0
3	Whitney Houston	The Bodyguard	1992	0:57:44	R&B, soul, pop	27.4	44	17-Nov-92	Y	8.5
4	Meat Loaf	Bat Out of Hell	1977	0:46:33	hard rock, progressive rock	20.6	43	21-Oct-77	NaN	8.0

Dataframes

ROWS

columns

	Artist	Album	Released	Length	Genre	Music Recording Sales (millions)	Claimed Sales (millions)	Released.1	Soundtrack	Rating
0	Michael Jackson	Thriller	1982	0:42:19	pop, rock, R&B	46.0	65	30-Nov-82	NaN	10.0
1	AC/DC	Back in Black	1980	0:42:11	hard rock	26.1	50	25-Jul-80	NaN	9.5
2	Pink Floyd	The Dark Side of the Moon	1973	0:42:49	progressive rock	24.2	45	01-Mar-73	NaN	9.0
3	Whitney Houston	The Bodyguard	1992	0:57:44	R&B, soul, pop	27.4	44	17-Nov-92	Y	8.5
4	Meat Loaf	Bat Out of Hell	1977	0:46:33	hard rock, progressive rock	20.6	43	21-Oct-77	NaN	8.0
5	Eagles	Their Greatest Hits (1971-1975)	1976	0:43:08	rock, soft rock, folk rock	32.2	42	17-Feb-76	NaN	7.5
6	Bee Gees	Saturday Night Fever	1977	1:15:54	disco	20.6	40	15-Nov-77	Y	7.0
7	Fleetwood Mac	Rumours	1977	0:40:01	soft rock	27.9	40	04-Feb-77	NaN	6.5

Dataframes

```
songs = {'Album' : ['Thriller','Back in Black', 'The Dark Side of the Moon',  
'The Bodyguard','Bat Out of Hell'],  
'Released' : [1982,1980,1973,1992,1977],  
'Length':[ '00:42:19','00:42:11','00:42:49','00:57:44','00:46:33']}  
print(songs)
```

	Album	Length	Released
0	Thriller	00:42:19	1982
1	Back in Black	00:42:11	1980
2	The Dark Side of the Moon	00:42:49	1973
3	The Bodyguard	00:57:44	1992
4	Bat Out of Hell	00:46:33	1977

Question

What python object do you cast to a dataframe?

- set
- tuple
- dictionary



Correct

correct

Skip

Continue

Question

y=df[]

How would you access the first-row and first column in the dataframe **df**?



```
1 df.ix[0, 0]
```



```
1 df.ix[0, 1]
```



```
1 df.ix[1, 0]
```

✓ Correct

Skip

Continue

```
y=df[ ['Artist' , 'Length' , 'Genre' ] ]
```

Artist	Album	Release	Length	Genre	Music Recording Sales [millions]	Claimed Sales [millions]	Released:1	Soundtrack	Rating
Michael Jackson	Thriller	1982	0:42:19	pop, rock, R&B	45.0	65	30-Nov-82	NaN	10.0
AC/DC	Back in Black	1980	0:42:11	hard rock	26.1	50	29-Jul-80	NaN	9.5
Pink Floyd	The Dark Side of the Moon	1973	0:42:49	progressive rock	24.2	45	01-Mar-73	NaN	9.0
Whitney Houston	The Bodyguard	1992	0:57:44	R&B, soul, pop	27.4	44	17-Nov-92	Y	8.5
Meat Loaf	Bat Out of Hell	1977	0:48:33	hard rock, progressive rock	20.6	43	21-Oct-77	NaN	8.0
Eagles	Their Greatest Hits (1971-1975)	1975	0:43:08	rock, soft rock, folk rock	32.2	42	17-Feb-76	NaN	7.5
Bee Gees	Saturday Night Fever	1977	1:15:54	disco	20.6	40	15-Nov-77	Y	7.0
Fleetwood Mac	Rumours	1977	0:40:01	soft rock	27.8	40	04-Feb-77	NaN	6.5



	Artist	Length	Genre
0	Michael Jackson	0:42:19	pop, rock, R&B
1	AC/DC	0:42:11	hard rock
2	Pink Floyd	0:42:49	progressive rock
3	Whitney Houston	0:57:44	R&B, soul, pop
4	Meat Loaf	0:48:33	hard rock, progressive rock
5	Eagles	0:43:08	rock, soft rock, folk rock
6	Bee Gees	1:15:54	disco
7	Fleetwood Mac	0:40:01	soft rock

```
df['Released'].unique()
```

	Released
0	1982
1	1980
2	1973
3	1992
4	1977
5	1976
6	1977
7	1977

1982
1980
1973
1992
1977
1976

df['Released']>=1980

	Artist	Album	Released	Length	Genre	Music Recording Sales (millions)	Claimed Sales (millions)	Released.t	Soundtrack	Rating
0	Michael Jackson	Thriller	1982	0:42:19	pop, rock, R&B	46.0	65	30-Nov-82	NaN	10.0
1	AC/DC	Back in Black	1980	0:42:11	hard rock	26.1	50	25-Jul-80	NaN	9.5
2	Pink Floyd	The Dark Side of the Moon	1973	0:42:49	progressive rock	24.2	45	01-Mar-73	NaN	9.0
3	Whitney Houston	The Bodyguard	1992	0:57:44	R&B, soul, pop	27.4	44	17-Nov-92	Y	8.5
4	Meat Loaf	Bat Out of Hell	1977	0:46:33	hard rock, progressive rock	20.6	43	21-Oct-77	NaN	8.0
5	Eagles	Their Greatest Hits (1971-1975)	1976	0:43:08	rock, soft rock, folk rock	32.2	42	17-Feb-76	NaN	7.5
6	Bee Gees	Saturday Night Fever	1977	1:15:54	disco	20.6	40	15-Nov-77	Y	7.0
7	Fleetwood Mac	Rumours	1977	0:40:01	soft rock	27.9	40	04-Feb-77	NaN	6.5



0	True
2	True
3	False
4	True
5	False
6	False
7	False
8	False

df1=df[df['Released']>=1980]

	Artist	Album	Released	Length	Genre	Music Recording Sales (millions)	Claimed Sales (millions)	Released.1	Soundtrack	Rating
0	Michael Jackson	Thriller	1982	0:42:19	pop, rock, R&B	46.0	65	30-Nov-82	NaN	10.0
1	AC/DC	Back in Black	1980	0:42:11	hard rock	26.1	50	29-Jul-80	NaN	9.5
2	Pink Floyd	The Dark Side of the Moon	1973	0:42:49	progressive rock	24.2	45	01-Mar-73	NaN	9.0
3	Whitney Houston	The Bodyguard	1992	0:57:44	R&B, soul, pop	27.4	44	17-Nov-92	Y	8.5
4	Meat Loaf	Bat Out of Hell	1977	0:46:33	hard rock, progressive rock	20.6	43	21-Oct-77	NaN	8.0
5	Eagles	Their Greatest Hits (1971-1975)	1976	0:43:08	rock, soft rock, folk rock	32.2	42	17-Feb-76	NaN	7.5
6	Bee Gees	Saturday Night Fever	1977	1:15:54	disco	20.6	40	15-Nov-77	Y	7.0
7	Fleetwood Mac	Rumours	1977	0:40:01	soft rock	27.9	40	04-Feb-77	NaN	6.5

Save as CSV

```
df1. to_csv('new_songes.csv')
```

A blue back arrow icon.

Practice Quiz

Practice Quiz • 18 min • 6 total points

1. What python object do you cast to a dataframe?

1 / 1 point

- set
- tuple
- dictionary

A green checkmark icon.

Correct

correct

2. How would you access the first-row and first column in the dataframe df?

1 / 1 point

- df.ix[0,0]
- df.ix[0,1]
- df.ix[1,0]

A green checkmark icon.

Correct

correct

[Back](#) Practice Quiz

Practice Quiz • 18 min • 6 total points

3. What is the proper way to load a CSV file using pandas?

1 / 1 point

- pandas.from_csv('data.csv')
- pandas.load_csv('data.csv')
- pandas.read_csv('data.csv')
- pandas.import_csv('data.csv')

 Correct

correct

4. Use this dataframe to answer the question.

0 / 1 point

	Artist	Album	Released	Length	Genre	Music Recording Sales (millions)	Claimed Sales (millions)	Released.1	Soundtrack	Rating
0	Michael Jackson	Thriller	1982	0:42:19	pop, rock, R&B	46.0	65	30-Nov-82	NaN	10.0
1	AC/DC	Back in Black	1980	0:42:11	hard rock	26.1	50	25-Jul-80	NaN	9.5

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Practice Quiz • 18 min • 6 total points

5. Use this dataframe to answer the question.

0 / 1 point

	Artist	Album	Released	Length	Genre	Music Recording Sales (millions)	Claimed Sales (millions)	Released.1	Soundtrack	Rating
0	Michael Jackson	Thriller	1982	0:42:19	pop, rock, R&B	46.0	65	30-Nov-82	NaN	10.0
1	AC/DC	Back in Black	1980	0:42:11	hard rock	26.1	50	25-Jul-80	NaN	9.5
2	Pink Floyd	The Dark Side of the Moon	1973	0:42:49	progressive rock	24.2	45	01-Mar-73	NaN	9.0
3	Whitney Houston	The Bodyguard	1992	0:57:44	R&B, soul, pop	27.4	44	17-Nov-92	Y	8.5
4	Meat Loaf	Bat Out of Hell	1977	0:46:33	hard rock, progressive rock	20.6	43	21-Oct-77	NaN	8.0
5	Eagles	Their Greatest Hits (1971-1975)	1976	0:43:08	rock, soft rock, folk rock	32.2	42	17-Feb-76	NaN	7.5
6	Bee Gees	Saturday Night Fever	1977	1:15:54	disco	20.6	40	15-Nov-77	Y	7.0
7	Fleetwood Mac	Rumours	1977	0:40:01	soft rock	27.9	40	04-Feb-77	NaN	6.5

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Practice Quiz

Practice Quiz • 18 min • 6 total points

5	Eagles	Their Greatest Hits (1971-1975)	1976	0:43:08	rock, soft rock, folk rock	32.2	42	17-Feb-76	NaN	7.5
6	Bee Gees	Saturday Night Fever	1977	1:15:54	disco	20.6	40	15-Nov-77	Y	7.0
7	Fleetwood Mac	Rumours	1977	0:40:01	soft rock	27.9	40	04-Feb-77	NaN	6.5

How do we select Albums The Dark Side of the Moon to Their Greatest Hits
(1971-1975)? Select all that apply.

- df.iloc[2:5, 'Album']
- df.loc[2:5, 'Album']
- df.iloc[2:6, 1]

 Correct

correct

- df.loc[2:5, 1]

You didn't select all the correct answers

[Back](#)

Practice Quiz

Practice Quiz • 18 min • 6 total points

5	Eagles	Their Greatest Hits (1971-1975)	1976	0:43:08	rock, soft rock, folk rock	32.2	42	17-Feb-76	NaN	7.5
6	Bee Gees	Saturday Night Fever	1977	1:15:54	disco	20.6	40	15-Nov-77	Y	7.0
7	Fleetwood Mac	Rumours	1977	0:40:01	soft rock	27.9	40	04-Feb-77	NaN	6.5

Which will NOT evaluate to 20.6? Select all that apply.

- df.iloc[4,5]
- df.iloc[6,5]
- df.loc[4,'Music Recording Sales']

 **Correct**

correct

- df.iloc[6, 'Music Recording Sales (millions)']

 **Correct**

correct

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Practice Quiz • 18 min • 6 total points

4	Meat Loaf	Bat Out of Hell	1977	0:46:33	hard rock, progressive rock	20.6	43	21-Oct-77	NaN	8.0
5	Eagles	Their Greatest Hits (1971-1975)	1976	0:43:08	rock, soft rock, folk rock	32.2	42	17-Feb-76	NaN	7.5
6	Bee Gees	Saturday Night Fever	1977	1:15:54	disco	20.6	40	15-Nov-77	Y	7.0
7	Fleetwood Mac	Rumours	1977	0:40:01	soft rock	27.9	40	04-Feb-77	NaN	6.5

How would you select the Genre disco? Select all that apply.

- df.iloc[6, 'genre']
- df.loc[6, 5]
- df.iloc[6, 4]



Correct

correct

- df.loc['Bee Gees', 'Genre']

5. Use this dataframe to answer the question.

1 / 1 point

Objectives

- The Basics and Array Creation
- Indexing and Slicing
- Basic Operations
- Universal Functions

`a=[“0”, 1, “two”, “3”, 4]`



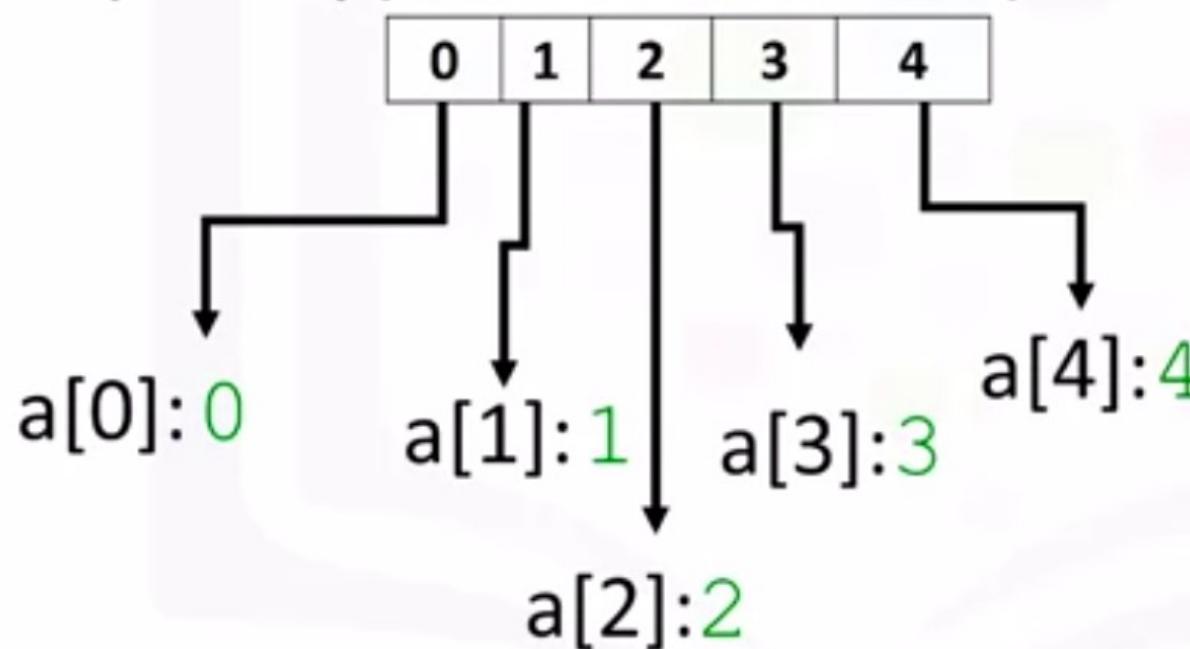
`a[0]: “0”`

`a[1]: 1`

`a[3]: “3” a[4]: 4`

`a[2]: “two”`

```
import numpy as np  
a=np.array( [0, 1, 2, 3, 4] )
```



```
a:array([0, 1, 2, 3, 4])
```

```
type(a): numpy.ndarray
```

```
a.dtype:dtype('int64')
```



Question

what is the type of the following array:

```
1 a=np.array([0,1,7,3, 7])
```

- int
- numpy.ndarray

✓ **Correct**
correct

Skip

Continue

```
a=np.array([0,1,2,3,4])
```

1	2	3	4	5
---	---	---	---	---

a.size :5

a.ndim: 1

a.shape: (5,)

```
b=np.array([3.1,11.02,6.2, 213.2,5.2])
```

```
type(b): numpy.ndarray
```

```
b.dtype: dtype('float64')
```

Indexing and Slicing

```
c=np.array([20,1,2,3, 4])
```

```
c:array([20,1,2,3, 4])
```

```
c[0]=100
```

```
c:array([100,1,2,3,4])
```

```
c[4]=0
```

```
c:array([100,1,2,3,0])
```

```
c:array([100, 1, 2, 3, 0])
```

0	1	2	3	4
---	---	---	---	---

```
d=c[1:4]
```

```
d:array([1, 2, 3])
```



```
c:array([100, 1, 2, 3, 0])
```

0	1	2	3	4
---	---	---	---	---

```
c[3:5]=300,400
```

```
c:array([100, 1, 2, 300, 400])
```



Question

consider the following lines of code:

```
1 c=np.array([20,1,2,3,4])
2
3 c[0]=100
4
5 c[0]=2
```

what is the value of **c[0]**

- 100
- 20
- 2

✓ **Correct**
correct

Skip

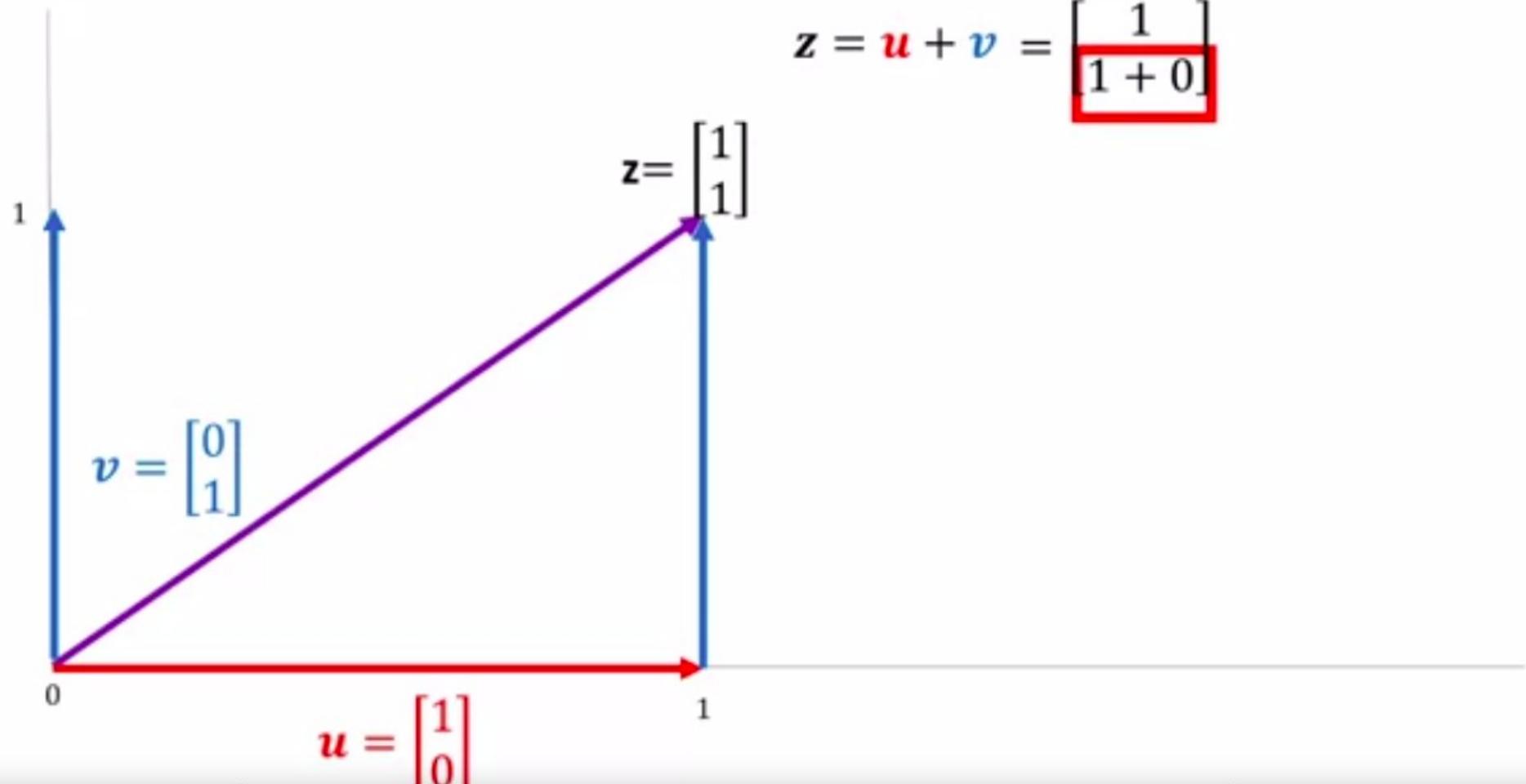
Continue

Basic Operations

Vector Addition and Subtraction

$$u = \begin{bmatrix} 1 \\ 0 \end{bmatrix} \quad v = \begin{bmatrix} 0 \\ 1 \end{bmatrix}$$

$$z = u + v = \begin{bmatrix} 1+0 \\ 0+1 \end{bmatrix} = \begin{bmatrix} 1 \\ 1 \end{bmatrix}$$



the base of the first vector \mathbf{u} with the tail of the

```
u=[1, 0]
```

```
v=[0, 1]
```

```
z=[ ]
```

```
for n, m in zip(u,v):
```

```
    z.append(n+m)
```

```
u=np.array([1,0])
v=np.array([0,1])

z=u+v
z:array([1, 1])
```

```
u=[1, 0]
v=[0, 1]
z=[ ]
```

```
for n, m in zip(u,v):
    z.append(n+m)
```

```
u=np.array([1,0])
v=np.array([0,1])

z=u-v
z:array([1,-1])
```

```
u=[1, 0]
v=[0, 1]
z=[ ]
```

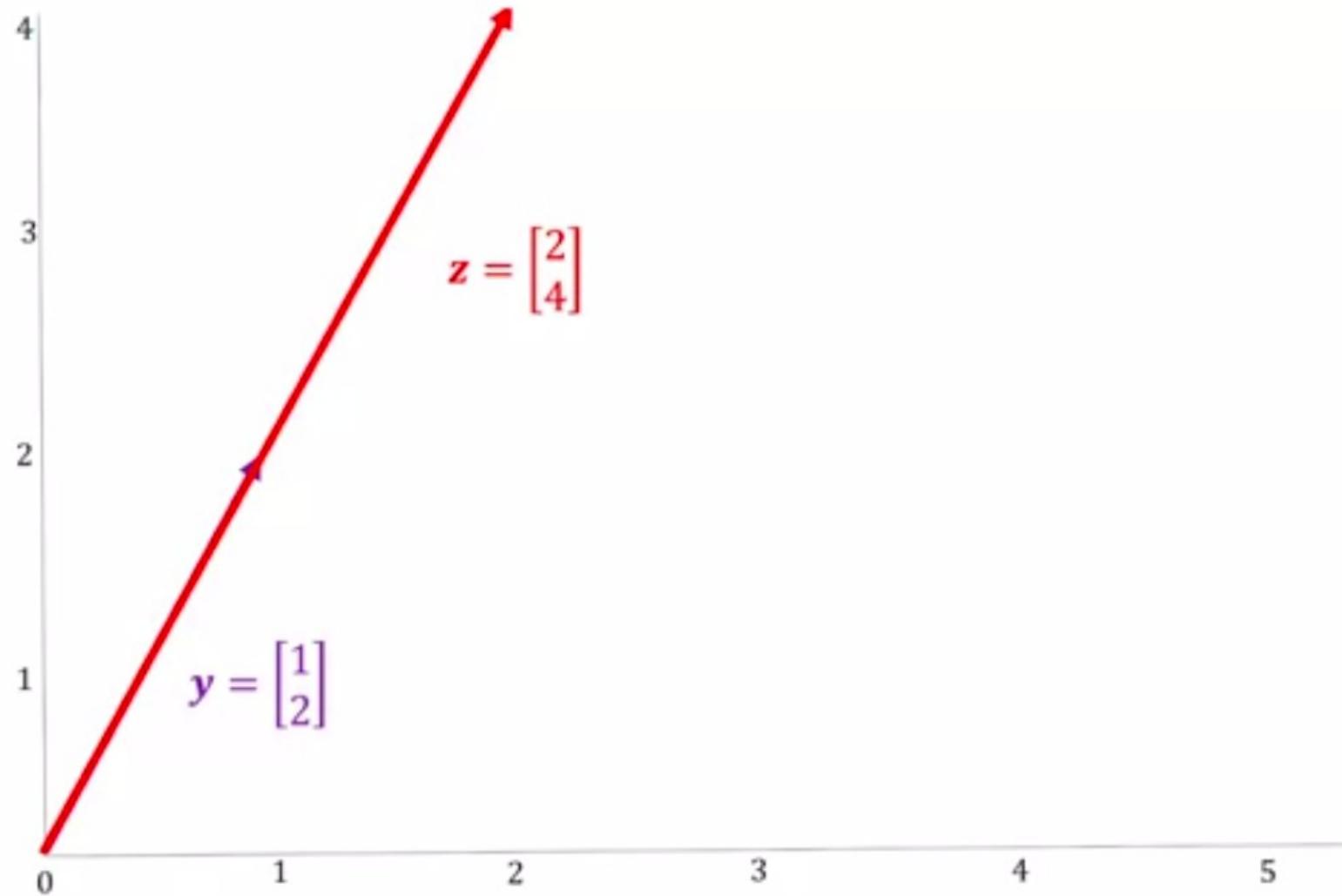
```
for n, m in zip(u,v):
    z.append(n-m)
```

Array multiplication with a Scalar

$$\mathbf{y} = \begin{bmatrix} 1 \\ 2 \end{bmatrix}$$

$$\mathbf{z} = 2\mathbf{y} = \begin{bmatrix} 2(1) \\ 2(2) \end{bmatrix} = \begin{bmatrix} 2 \\ 4 \end{bmatrix}$$

Each component of the vector is multiplied by two,



the vector is stretched out by two units as shown in red.

Question

y=

consider the numpy array `u` how would you multiply each element in the numpy array by 2

- `2*u`
- `[2,2]*u`

 **Correct**
correct

Skip

Continue

```
y=np.array([1,2])
```

```
z=2*y
```

```
z=array([2,4])
```

```
y=[1 , 2]
```

```
z=[ ]
```

```
for n in y:
```

```
    z.append(2*n)
```

Product of two numpy arrays

$$u = \begin{bmatrix} 1 \\ 2 \end{bmatrix} \quad v = \begin{bmatrix} 3 \\ 2 \end{bmatrix}$$

$$z = u \circ v = \begin{bmatrix} 1*3 \\ 2*2 \end{bmatrix} = \begin{bmatrix} 3 \\ 4 \end{bmatrix}$$

```
u=np.array([1,2])
v=np.array([3,2])
z=u*v
z:array([3, 4])
```

```
u=[1 , 2]
v=[3 , 2]
z=[ ]
for n, m in zip(u,v):
    z.append(n*m)
```

Dot Product

$$u = \begin{bmatrix} 1 \\ 2 \end{bmatrix} \quad v = \begin{bmatrix} 3 \\ 1 \end{bmatrix}$$

$$u^T v = \boxed{1} \times \boxed{3} + \boxed{2} \times \boxed{1} = 5$$

Question

how would you perform the dot product between the numpy arrays **u** and **v**

np.dot(u,v)

u*v

U=

Skip

Submit

```
u=np.array([1,2])
```

```
v=np.array([3,1])
```

```
result =np.dot(u,v)
```

```
result :5
```

We can also perform dot product using the numpy function

Universal Functions

Adding Constant to an numpy Array

```
u=np.array([1,2,3,-1])
```

```
z=u+1
```

```
z:array([2,3,4,0])
```

1, 2, 3, -1



1+1, 2+1, 3+1, -1+1



This property is known as broadcasting.

Universal Functions

```
a=np.array([1,-1,1,-1])
```

```
mean_a=a.mean()
```

```
mean_a:0.0
```

$$\begin{aligned}\frac{1}{4} (1 - 1 + 1 - 1) \\ = 0\end{aligned}$$

Universal Functions

```
b=np.array([1, -2, 3, 4, 5])
```

```
max_b=b.max()
```

```
max_b:5
```

Universal Functions

```
np.pi
```

```
x=np.array([ 0 , np.pi/2, np.pi ] )
```

```
y=np.sin(x)
```

```
y:array([ 0,1, 1.2e-16])
```

 π

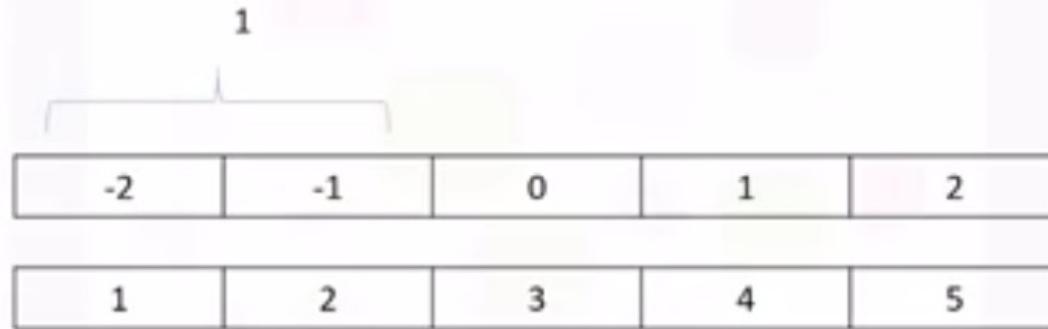
$$x = [0, \frac{\pi}{2}, \pi]$$

$$y = [\sin(0), \sin(\frac{\pi}{2}), \sin(\pi)]$$

$$y = [0, 1, 0]$$



```
np.linspace(-2,2,num=5)
```



```
np.linspace(-2,2 num=9
```

-2	-1.5	-1	-0.5	0	0.5	1	1.5	2
----	------	----	------	---	-----	---	-----	---

1	2	3	4	5	6	7	8	9
---	---	---	---	---	---	---	---	---

Plotting Mathematical Functions

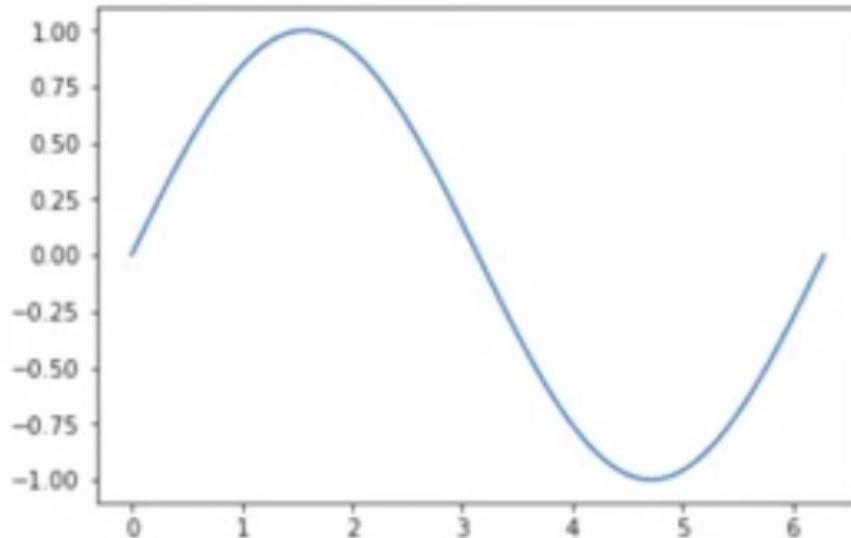
```
x=np.linspace( 0 , 2*np.pi,100)
```

```
y=np.sin(x)
```

```
import matplotlib.pyplot as plt
```

```
%matplotlib inline
```

```
plt.plot(x,y)
```



The first input corresponds to

Table of Contents

- The Basics and Array Creation in 2D
- Indexing and Slicing in 2D
- Basic Operations in 2D

```
a = [[11, 12, 13], [21, 22, 23], [31, 32, 33]]
```

```
A = np.array(a)
```

```
A: [[11 12 13]
      [21 22 23]
      [31 32 33]]
```

A.ndim:2

A.shape: (3 3)

`[[11, 12, 13], [21, 22, 23], [31, 32, 33]]`

The diagram shows a 3x3 matrix with curly braces indicating the dimensions. The outermost curly brace spans all three rows and is labeled '3'. The middle curly brace spans all three columns and is labeled '3'. The innermost curly brace is at the bottom left and is labeled '3'.

`[11 12 13]`
`[21 22 23]`
`[31 32 33]`

The diagram shows a 3x3 matrix with a single curly brace at the bottom left corner, spanning all three rows and columns, indicating the total size of the matrix.

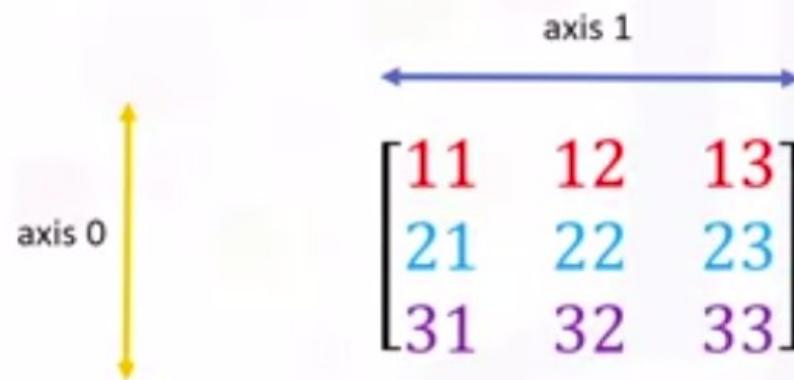
the nested list or the number of 3



A.ndim:2

A.shape: (3 3)

$[[11, 12, 13], [21, 22, 23], [31, 32, 33]]$



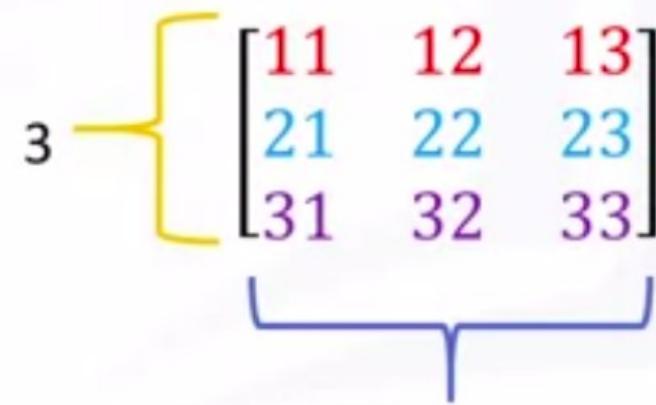
A.ndim:2

A.shape: (3,3)

A.size : 9

[[11, 12, 13], [21, 22, 23], [31, 32, 33]]

3x3=9



Multiplying the number of columns and rows together,

Question

A: [

what is the shape of the following array:

[2][2]]

```
1 A=np.array([[1, 0, 1], [0, 1, 1]])
```

- (2,3)
- (3,2)
- 6



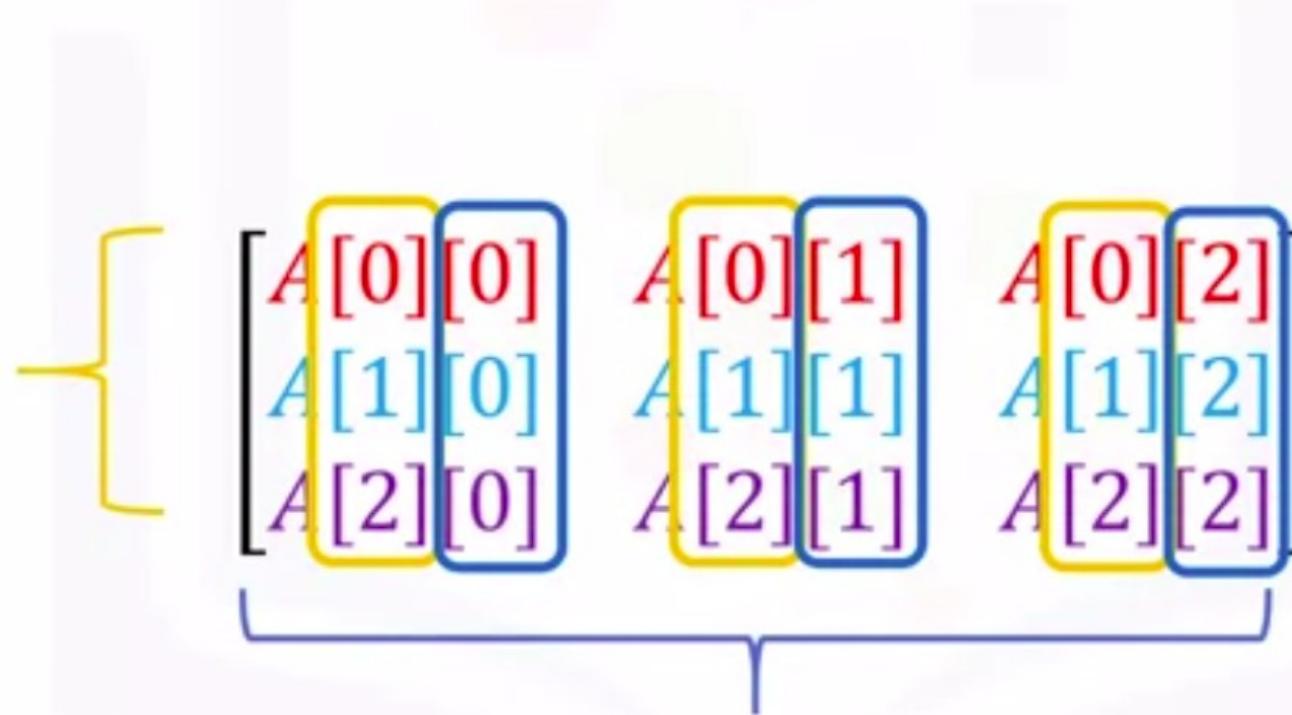
Correct

correct, the first element of the tuple is the number of rows the second is the number of columns

Skip

Continue

$A: [[A[0][0], A[0][1], A[0][2]], [A[1][0], A[1][1], A[1][2]], [A[2][0], A[2][1], A[2][2]]]$



The second index corresponds to the column index.

$A: [A[0,0], A[0,1], A[0,2]], [A[1,0], A[1,1], A[1,2]] [A[2,0], A[2,1], A[2,2]]]$

$$\begin{bmatrix} A[0,0] & A[0,1] & A[0,2] \\ A[1,0] & A[1,1] & A[1,2] \\ A[2,0] & A[2,1] & A[2,2] \end{bmatrix}$$

$$A = [[11, 12, 13], [21, 22, 23], [31, 32, 33]]$$

A[1][2] : 23

	0	1	2
0	11	12	13
1	21	22	23
2	31	32	33

Example 4.2

$$A = [[11, 12, 13], [21, 22, 23], [31, 32, 33]]$$

$A[0][0] : 11$

	0	1	2
0	11	12	13
1	21	22	23
2	31	32	33

A

Question

consider the following array:

```
1 A=np.array([[1,0,1],[2,2,2]])
```

what is the value in **A[0,1]**

- 0
- 1
- 2

 **Correct**
correct

Skip

Continue

$A[0,0:2]$ 

0	11	12	13
1	21	22	23
2	31	32	33

The second index accesses the first two columns.

$$A = [[11, 12, 13], [21, 22, 23], [31, 32, 33]]$$

`A[0: 2,2]:array([13, 23])`

	0	1	2
0	11	12	13
1	21	22	23
2	31	32	33

Example 4.2

$$X = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} \quad Y = \begin{bmatrix} 2 & 1 \\ 1 & 2 \end{bmatrix}$$

$$X + Y = \begin{bmatrix} 1+2 & 0+1 \\ 0+1 & 1+2 \end{bmatrix} = \begin{bmatrix} 3 & 1 \\ 1 & 3 \end{bmatrix}$$

```
X=np.array([[1,0],[0,1]])  
Y=np.array([[2,1],[1,2]])  
Z=X+Y;  
Z:array([[3,1],  
         [1,3]])
```

$$X = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$

$$Y = \begin{bmatrix} 2 & 1 \\ 1 & 2 \end{bmatrix}$$

$$Z = X + Y$$

$$Z = \begin{bmatrix} 3 & 1 \\ 1 & 3 \end{bmatrix}$$

$$Y = \begin{bmatrix} 2 & 1 \\ 1 & 2 \end{bmatrix}$$

$$2Y = \begin{bmatrix} 2 \times 2 & 2 \times 1 \\ 2 \times 1 & 2 \times 2 \end{bmatrix} = \begin{bmatrix} 4 & 2 \\ 2 & 4 \end{bmatrix}$$

```
Y=np.array([[2,1],[1,2]])
```

$$Y = \begin{bmatrix} 2 & 1 \\ 1 & 2 \end{bmatrix}$$

```
Z=2*Y;
```

```
Z=array([[4,2],  
         [2,4]])
```

$$Z = 2Y = \begin{bmatrix} (2)2 & (2)1 \\ (2)1 & (2)2 \end{bmatrix}$$

$$Z = \begin{bmatrix} 4 & 2 \\ 2 & 4 \end{bmatrix}$$



Question

What is the result of the following operation:

```
1  Y=np.array([[2,1],[1,2]])  
2  Z=2*Y
```

- array([[4, 2],
 [2, 4]])
- array([[2, 2],
 [2, 2]])
- array([[2, 1],
 [1, 2]])



Correct

correct, multiplying the array by two doubles each element

Skip

Continue

$$X = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} \quad Y = \begin{bmatrix} 2 & 1 \\ 1 & 2 \end{bmatrix}$$

$$X \circ Y = \begin{bmatrix} (1)2 & (0)1 \\ (0)1 & (1)2 \end{bmatrix} = \begin{bmatrix} 2 & 0 \\ 0 & 2 \end{bmatrix}$$



```
X=np.array([[1,0],[0,1]])
```

```
Y=np.array([[2,1][1,2]])
```

```
Z=X*Y;
```

```
Z=array([[2,0],  
          [0,2]])
```

$$X = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$
$$Y = \begin{bmatrix} 2 & 1 \\ 1 & 2 \end{bmatrix}$$

$$Z = X \circ Y = \begin{bmatrix} (1)2 & (0)1 \\ (0)1 & (1)2 \end{bmatrix}$$

$$Z = \begin{bmatrix} 2 & 0 \\ 0 & 2 \end{bmatrix}$$

$$A = \begin{bmatrix} 0 & 1 & 1 \\ 1 & 0 & 1 \end{bmatrix}$$

$$B = \begin{bmatrix} 1 & 1 \\ 1 & 1 \\ -1 & 1 \end{bmatrix}$$

$$0 \times 1 + 1 \times 1$$

$$A \cdot B = \begin{bmatrix} \end{bmatrix}$$

the first row of A with the first column of B as follows.

$$A = \begin{bmatrix} 0 & 1 & 1 \\ 1 & 0 & 1 \end{bmatrix}$$

$$B = \begin{bmatrix} 1 & 1 \\ 1 & 1 \\ -1 & 1 \end{bmatrix}$$

$$AB = \begin{bmatrix} 0 & \boxed{} \end{bmatrix}$$

The result is zero.

$$A = \begin{bmatrix} 0 & 1 & 1 \\ 1 & 0 & 1 \end{bmatrix}$$

$$B = \begin{bmatrix} 1 & 1 \\ 1 & 1 \\ -1 & 1 \end{bmatrix}$$

$$0 \times 1 + 1 \times 1 + 1 \times 1 = 2$$

$$AB = \begin{bmatrix} 0 & 2 \end{bmatrix}$$

$$A = \begin{bmatrix} 0 & 1 & 1 \\ 1 & 0 & 1 \end{bmatrix}$$

$$B = \begin{bmatrix} 1 & 1 \\ 1 & 1 \\ -1 & 1 \end{bmatrix}$$

$$1 \times 1 + 0 \times 1 + 1 \times 1 = 0$$

$$AB = \begin{bmatrix} 0 & 2 \\ 0 & \end{bmatrix}$$

$$A = \begin{bmatrix} 0 & 1 & 1 \\ 1 & 0 & 1 \end{bmatrix}$$

$$B = \begin{bmatrix} 1 & 1 \\ 1 & 1 \\ -1 & 1 \end{bmatrix}$$

$$1 \times 1 + 0 \times 1 + (1) \times 1 = 2$$

$$AB = \begin{bmatrix} 0 & 2 \\ 0 & 2 \end{bmatrix}$$

```
A=np.array([[0,1,1],[1,0,1]])
```

```
B=np.array([[1,1],[1,1],[-1,1]])
```

```
C=np.dot(A,B);
```

```
C:array([[0,2],  
         [0,2]])
```

[Back](#)

Practice Quiz

Practice Quiz • 12 min • 4 total points

1. What is the Python library used for scientific computing and is a basis for Pandas?

1 / 1 point

- Requests
- Tkinter
- datetime
- Numpy

Correct

2. What attribute is used to retrieve the number of elements in an array?

1 / 1 point

- a.size
- a.ndim
- a.shape
- a.dtype

[Back](#)

Practice Quiz

Practice Quiz • 12 min • 4 total points

3. How would you change the first element to "10" in this array `c:array([100,1,2,3,0])`?

1 / 1 point

- c[0]=10
- c[1]=10
- c[2]=10
- c[4]=10

Correct

4. What attribute is used to return the number of dimensions in an array?

1 / 1 point

- a.shape
- a.dtype
- a.ndim
- a.size

✓ Congratulations! You passed!

Grade received 100% Latest Submission Grade 100% To pass 70% or higher

Go to next item

1. What is the result of the following lines of code?

1 / 1 point

```
1 a=np.array([-1,1])
2 b=np.array([1,1])
3 np.dot(a,b)
```

- array([0,2])
- 1
- 0

✓ Correct
correct

2. How do you perform matrix multiplication on the numpy arrays **A** and **B** ?

1 / 1 point

- A+B
- A*B
- np.dot(A,B)

 Correct

correct

3. What values does the variable **out** take if the following lines of code are run?

1 / 1 point

```
1
2 X=np.array([[1,0,1],[2,2,2]])
3 out=X[0:2,2]
4 out
5
```

- array([1,0])
- array([1,2])
- array([1,1])

 Correct

correct, the first index corresponds to the rows the second index corresponds to the columns

Correct

correct, the first index corresponds to the rows the second index corresponds to the columns

4. What is the value of **Z** after the following code is run?

1 / 1 point

```
1 X=np.array([[1,0],[0,1]])  
2 Y=np.array([[2,2],[2,2]])  
3 Z=np.dot(X,Y)  
4  
5
```

- array([[2,2],[2,2]])
- array([[2,0],[0,2]])
- array([[3,2],[2,3]])

Correct

correct, the dot function corresponds to matrix multiplication

5. Consider the following text file: **Example1.txt**:

1 / 1 point

This is line 1

5. Consider the following text file: **Example1.txt**:

1 / 1 point

This is line 1

This is line 2

This is line 3

What is the output of the following lines of code?

```
1
2  with open("Exampl1.txt", "r") as File1:
3
4      file_stuff=File1.readline ()
5
6      print(file_stuff)
```

This is line 1

This is line 1

This is line 2

This is line 3

This is line 1

This is line 2

 **Correct**

Correct

Correct

6. What do the following lines of code do?

1 / 1 point

```
1
2     with open("Example1.txt","r") as file1:
3
4         FileContent=file1.readlines()
5
6         print(FileContent)
7
```

- Read the file "Example1.txt"
- Write to the file "Example1.txt"
- Append the file "Example1.txt"

Correct

Correct, the mode is set to r for read.

7. What do the following lines of code do?

1 / 1 point

1

Correct

Correct, the mode is set to r for read.

7. What do the following lines of code do?

```
1  with open("Example.txt", "a") as writefile:  
2      writefile.write("This is line A\\n")  
3      writefile.write("This is line B\\n")
```

1 / 1 point

- Append the file "Example.txt"
- Write to the file "Example.txt"
- Read the file "Example.txt"

Correct

Correct.

8. What task do the following lines of code perform?

1 / 1 point

```
1  with open('Example2.txt', 'r') as readfile:  
2      with open('Example3.txt', 'w') as writefile:  
3          for line in readfile:  
4              ...
```

8. What task do the following lines of code perform?

1 / 1 point

```
1
2     with open('Example2.txt','r') as readfile:
3         with open('Example3.txt','w') as writefile:
4             for line in readfile:
5                 writefile.write(line)
6
```

- Copy the text from Example2.txt to Example3.txt.
- Print out the content of Example2.txt.
- Check the mode of the open function for each file object.

 Correct

Correct.

9. Consider the dataframe **df**. How would you access the element in the 1st row 3rd column

1 / 1 point

- df.iloc[2,0]
- df.iloc[1,3]
- df.iloc[0,2]

 Correct

correct



Correct.

9. Consider the dataframe `df`. How would you access the element in the 1st row 3rd column

1 / 1 point

- `df.iloc[2,0]`
- `df.iloc[1,3]`
- `df.iloc[0,2]`



correct

10. What method gets the unique elements of the following: `df['Length']` ?

1 / 1 point

- `unique`
- `head`



correct